

NASA Technical Memorandum 102541

(NASA-TM-102541) AEROPROPULSION FACILITIES
CONFIGURATION CONTROL: PROCEDURES MANUAL
(NASA) 24 p CSCL 14D

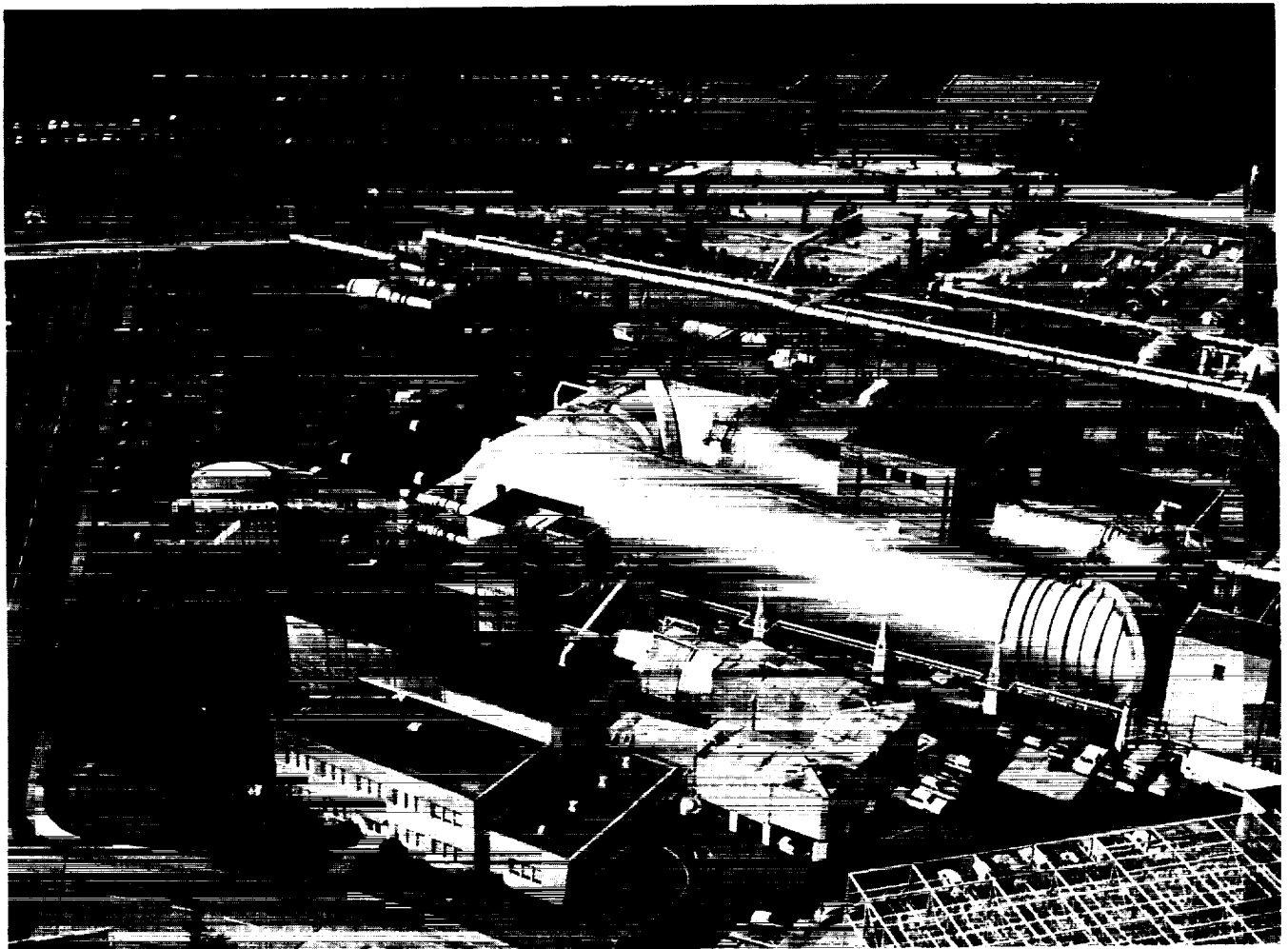
N90-21599

Unclass

G3/38 0272829

Aeropropulsion Facilities Configuration Control

Procedures Manual



Aeronautics Directorate

March 1990

FOREWORD

This manual describes the policy, requirements, responsibilities, and procedures for implementing the Aeropropulsion Facilities Configuration Control Program at the NASA Lewis Research Center.

The program is managed by the Facilities Management Branch of the Aeropropulsion Facilities and Experiments Division and is implemented by a support service contractor. This manual defines the guidelines for all personnel associated with configuration control and documentation maintenance of the aeropropulsion facilities.

A handwritten signature in cursive script, appearing to read "Frank J. Kutina".

Franklin J. Kutina
Chief, Aeropropulsion Facilities and Experiments Division

TABLE OF CONTENTS

	<u>Page</u>
1.0 Introduction	1
2.0 Authority	1
3.0 Policy	1
4.0 Applicability	1
5.0 Responsibilities	1
5.1 Facilities Management Branch	2
5.2 Originator of Facility Configuration Change	2
5.3 Configuration Control Support Service Contractor	3
5.4 Configuration Control Coordinator	3
6.0 Aeropropulsion Facilities Configuration Control	3
6.1 General Overview of Objectives	3
6.2 Facility Baseline Configuration and Description of Documents	4
6.2.1 Facility Baseline Criteria	4
6.2.2 Drawings	4
6.2.3 Manuals and Critical Data	5
6.2.4 Operating Procedures	5
6.2.5 Software	6
6.3 Control and Maintenance of Documents	6
6.3.1 Central Drawing Files	6
6.3.2 CAD-Generated Drawings: CADAM Baseline Management Files	7
6.3.3 Configuration Control Contractor's Files	7
6.3.4 Research Facility Drawing Files	8
6.4 Change Control System	8
6.4.1 Definition	8
6.4.2 Overview of a Typical Change Process	9
6.4.3 Operational Emergencies	9
6.4.4 Programmatically Driven Temporary Changes	9
6.4.5 Major Modifications or Construction of Facility Changes	10
6.4.6 Operating Procedure (Checksheet) Changes	10
6.5 Procedures for Processing Facility Changes	10
6.5.1 Change Request Initiation	10
6.5.2 Review, Approval, and Assignment of Control Number	10

6.5.3	Change Implementation Phase	11
6.5.4	Safety Review	11
6.5.5	Verification and Document Control	11
6.5.6	Request-for-Change Closeout	11
7.0	Audits	12
7.1	Work Request Reviews	12
7.1.1	Support Organizations' Work Requests	12
7.1.2	Test Installation Work Requests	13
7.2	Operating Procedure Reviews	13
8.0	Reporting	13
Appendix – Baseline Drawings Assessment, Updating, and Verification . . .		14

1.0 INTRODUCTION

This manual sets forth the policy and responsibility for configuration control of the aeropropulsion facilities at the NASA Lewis Research Center. Defined herein are the process and discipline established to control a facility's baseline configuration as designed and approved for safe operation. They ensure that key documents constituting the facility's configuration are kept current, modified as needed, and verified to reflect any approved changes. This is the essence of the Lewis Aeropropulsion Facilities Configuration Management (CM) Program.

2.0 AUTHORITY

Lewis Research Center senior management has directed the Aeropropulsion Facilities and Experiments Division (AFED) to establish and implement a configuration control system for the facilities in the Aeronautics Directorate. A support service contractor has been engaged to control and maintain the key documents constituting these facilities.

3.0 POLICY

The policy of the Aeronautics Directorate is that all aeropropulsion research facilities be put under configuration control. As a facility's baseline configuration is defined, that facility and its key documents, drawings, procedures, manuals, calibration data, etc., are officially put under configuration control and must be handled by the rules and procedures cited in this manual. Changes to a controlled facility baseline configuration or its documents can be accomplished only through the change control system (CCS) discussed in sections 6.4 and 6.5.

4.0 APPLICABILITY

The aeropropulsion facilities configuration control is applicable to the "facility" portion of an installation. It does not include what is known as the "research rig, model, experimental package, etc.," nor does it include central process systems, the control and upkeep of which are the responsibility of other organizations at Lewis.

New facilities are incorporated into the CM program after being approved for safety, successfully checked out, and deemed operational. Documents that constitute the facilities "baseline configuration" are identified and listed. They are reviewed to verify that they reflect the approved design, checked to ensure that the drawings agree with the installation, and then put under control according to the CCS.

5.0 RESPONSIBILITIES

Configuration control for the aeropropulsion facilities is the responsibility of all who are associated with those installations. Specific responsibilities are defined below and are generally outlined in figure 1.

5.1 FACILITIES MANAGEMENT BRANCH

The Facilities Management Branch lies within the Aeropropulsion Facilities and Experiments Division and coordinates and manages the activities related to the configuration control contractor. The branch chief, or his/her representative, serves as the "configuration control coordinator" who is responsible for coordinating the overall CM program. Each aeropropulsion facility, or group of facilities, has a facility manager from the Facilities Management Branch whose responsibilities related to configuration control are

- (1) To ensure compliance with the CM program within his/her area of responsibility
- (2) To review and approve or reject the concept of the proposed changes to a facility's configuration

5.2 ORIGINATOR OF FACILITY CONFIGURATION CHANGE

Under the CM program, the initiator of a proposed change to the facility or established operating procedures can be any person who has identified a need for a change. The tasks and responsibilities of the originator of a change are defined in section 6.5 but generally can be described as follows:

- (1) Prepares a work request (WR), task order (TO), or purchase request (PR) defining the proposed task.
- (2) Completes a request-for-change (RFC) form and attaches it to the order, along with supporting information, requesting the work or service; procedure change requests also require an RFC and marked-up procedures, or checksheets.
- (3) Submits the proposed change to the cognizant facility manager for approval prior to initiating the activities related to the proposed change.
- (4) Initiates and coordinates the implementation of the physical changes to a facility, as described in an approved RFC, through normal accepted procedures.
- (5) Obtains safety approval, when so indicated on an RFC by the facility manager, prior to putting into operation the approved changes.
- (6) Arranges with the CM contractor to make the necessary corrections when the configuration of a newly changed installation does not coincide with the new drawings.

5.3 CONFIGURATION CONTROL SUPPORT SERVICE CONTRACTOR

A support service contractor has been engaged to staff and manage the implementation of the CM program. The following is an overview of the contractor's tasks and responsibilities.

(1) Serves as authorized personnel for removal and return of controlled original drawings and reproductions from microfilm or computer-graphic augmented design and manufacturing (CADAM) drawings from central drawing files or CADAM-secured files.

(2) Ensures that copies of the latest revisions of drawings, procedures, and documents constituting the "facility baseline" are kept current in all facilities in the Aeropropulsion Facilities CM Program.

(3) Assigns control numbers and reports monthly to the configuration control coordinator on the status of approved changes in the facility's configuration and/or procedures; also performs audits relative to changes.

(4) Ensures that the completed work has been done as directed by an approved RFC form, and also ensures that the associated documents have been updated to reflect such changes.

5.4 CONFIGURATION CONTROL COORDINATOR

The coordinator of the configuration control program is a member of the Facilities Management Branch and has the overall responsibility for the activities associated with the CM program.

All RFC packages are routed through the coordinator from the originator, as described in the change control system. Any questions about the CM program, drafting responsibility, procedures, etc., should be referred to the coordinator for resolution.

6.0 AEROPROPULSION FACILITIES CONFIGURATION CONTROL

6.1 GENERAL OVERVIEW OF OBJECTIVES

The Lewis Aeropropulsion Facilities Configuration Management Program encompasses all the research facilities within the Aeronautics Directorate. A support service contractor is charged with performing two basic tasks in the CM program:

(1) Implementing and ensuring compliance with the Change Control System (CCS)

(2) Maintaining and controlling the Facility Baseline List (FBL) for each facility

6.2 FACILITY BASELINE CONFIGURATION AND DESCRIPTION OF DOCUMENTS

The baseline configuration of a facility is based on the criteria generally defined in section 6.2.1 and is further described in the appendix. After a facility's installation has been completed and successfully checked out, after documents have been verified to reflect the actual installation, and when the facility is deemed "operational" (i.e., ready for research testing), the facility baseline list of key documents is established and the facility officially enters into the CM program. Facility documents defining the facility baseline configuration are recorded in the facility baseline list and placed under configuration change control along with the facility. These documents include facility maintenance manuals, operating procedures, specific performance data, and drawings. The FBL drawings for each facility are listed in numerical order, including the latest revisions, and this list is given to the Lewis central drawing file and to CAD drawing file managers, along with limited access instructions.

6.2.1 Facility Baseline Criteria

Criteria for the selection and incorporation of documents to represent the facility baseline are generally described as those selected facility documents defining the approved configuration necessary for the safe operation of the facility. Examples of such documents include

- Facility system drawings such as mechanical schematics and elementary electrical diagrams
- Standard facility operating procedures, or checksheets
- Specific performance calibrations or data
- Safety analysis reports

Examples of documents generally not considered to be included in the FBL and not under configuration control are (1) selected vendor manuals and (2) facility drawings of a general nature such as layout, electrical conduit, component, architectural, or structural drawings.

The cognizant facility manager will resolve any FBL differences of opinion in consultation with the configuration control coordinator and the operations engineer(s) for specific facilities.

6.2.2 Drawings

A list of the drawings defining each specific facility's baseline configuration and the names of persons permitted to remove and return "originals" from controlled files is issued to the central drawing file contractor and CAD drawing file managers as an ongoing task within the CM office. The original drawings (reproducible masters) are placed under control where access is by specific

approval of the CM contractor manager or his/her designee. All requests for "blueprint" copies will be honored, but original drawings will remain in their controlled locations except as described above.

Access to hand-drawn reproducible masters for making changes is through the central drawing file contractor; access to CAD-generated original drawings for changes is through the designated person controlling the release file. However, both must be accompanied by an approved RFC before the originals can be released.

6.2.3 Manuals and Critical Data

Other selected documents relevant to the facility baseline, such as the facility instrumentation manual and calibration data, are placed under configuration control at the time of their approval by the facility manager. All changes to these documents must be accomplished through an RFC. Each document will have, immediately following the title page, a revision record sheet stating that the document is under configuration control (see fig. 2). Each document revision will be noted, referenced to the appropriate RFC, and contain the appropriate signatures.

A listing of the current approved facility baseline documents and all original maintenance manuals for each facility under configuration control will be maintained and updated by the CM contractor's office. A listing of all copies of manuals in the field will also be maintained by the CM contractor in order to ensure that all copies are kept current. An updated revision record sheet and copies of the revised pages of documents affected by a change will be distributed by the CM contractor to personnel who have signed out copies of documents under configuration control.

6.2.4 Operating Procedures

Operating procedures are designed to provide experienced operators with detailed operating instructions for all systems associated with a specific test, from prerun to postrun. Procedures are generally in the form of checksheets; in some cases they include additional information defining equipment operation.

Operating procedures, or checksheets, are developed for new facilities or for modifications to existing aeronautics facilities prior to their operation. A cover sheet is attached, bearing the name of the procedure, the latest revision date, and the appropriate stamp (fig. 3(a)), and the procedures are then placed under configuration control. The checksheets are configuration control documents and changes or deviations from the approved procedures are governed by the rules defined in section 6.4.6.

Copies of all checksheets bearing the latest revision date are kept in each respective facility and in the CM contractor's

files. It is the responsibility of the facility test director to ensure that copies of the checksheets for an upcoming test run are made from the latest revision.

6.2.5 Software

All software necessary for the operation of a facility (such as programmable controller logic) is represented on drawings and is under configuration control. Software for research hardware data acquisition is not included under facility configuration control. Any proposed facility software changes are to be processed through the change control system.

6.3 CONTROL AND MAINTENANCE OF DOCUMENTS

The CM program includes the control and maintenance of documents making up the FBL. Document control consists of the process for limiting access to master documents and the process of controlling changes to these documents. Document maintenance consists of keeping originals on file and keeping historical records.

There are four file systems under the aeropropulsion CM program: (1) central drawing files, (2) CADAM baseline management files, (3) CM contractor files, and (4) research facility files. Each shall be maintained and controlled as indicated below.

6.3.1 Central Drawing Files

The central drawing files are the repository for original reproducible tracings as well as microfilm representations of drawings that no longer have originals. Full-size hard copies of CAD-generated drawings are also stored in the central files after their release. All drawings, and revisions to drawings, are microfilmed by the central drawing files personnel.

A list of drawings for each aeropropulsion facility in the CM program has been compiled according to the criteria defined in section 6.2.1 and the appendix, in concurrence with the cognizant facility manager or his/her designee. These lists identify each facility's FBL and are so designated when presented to the central drawing files personnel, who are instructed to handle and control the master tracings or microfilmed representations of these designated drawings as follows:

(a) All FBL original tracings and microfilmed drawings (including CAD-generated drawings) are to have an aeropropulsion facility baseline drawing decal affixed (see figs. 3(b) and (c)).

(b) Original drawings can be removed or returned to the central files only by the configuration control contractor manager or his/her designee. The approved list of designees shall be posted at the central drawing files office along with controlled-access instructions.

(c) All requests for copies of the originals will be honored, but original drawings will not be removed from the central files except as stated in step (b).

6.3.2 CAD-Generated Drawings: CADAM Baseline Management Files

Some facility baseline drawings are generated on CADAM and stored electronically in a CADAM database management file. This file resides on the Lewis mainframe computer and contains specific drawing release files. Final copies of aeropropulsion facility baseline drawings that are CAD-generated are reproduced on vellum print, microfilmed, and then stored as hard copies in the central files. The drawing format has a note stating "CADAM drawings, do not revise manually," and has an aeropropulsion facility baseline drawing decal affixed stating "This Drawing Under Configuration Control" (see fig. 3(b)). This same decal is affixed to the central file microfilm card for all aeropropulsion facility baseline CADAM drawings. Revisions to CAD drawings are processed as follows:

(a) Copies of CADAM drawings can be used to mark up changes in red. However, all drawing revisions must be made on the computer to the CADAM "model." The release of files of specific CAD drawings is controlled by the organization having that file, and release-for-revisions procedures are dictated by these same organizations. These controlling organizations are instructed not to release any aeropropulsion baseline drawings for changes to anyone except the designated CM contractor personnel (list of names provided), and only when the request is accompanied by an approved RFC.

(b) Prior to reissuing a revised aeropropulsion facility CAD drawing, a new vellum will be generated from CADAM to be entered into the normal drawing approval cycle. The new vellum print (with the latest revision noted in the change block, along with the relevant RFC number(s)) will be released through the established release procedure, stored electronically, and microfilmed, and the physical copy will then be stored in control files. The vellum drawing that it replaces will be destroyed.

6.3.3 Configuration Control Contractor's Files

The contractor shall maintain and control several types of facility documents:

(a) Facility Baseline Lists

The FBL's are kept current by the CM contractor. All amendments are distributed to controlled drawing files personnel and the cognizant facility manager.

(b) Operating Procedure (Checksheet)

The CM contractor shall keep on file, and under control, a copy of the master of each facility's latest revision of the operating checksheet. These documents shall have

a cover sheet bearing a stamp indicating that they are under configuration control (fig. 3(a)). The test director is to ensure that copies for an upcoming facility operation are from the latest revision. A historical record of all procedure changes is the responsibility of the CM contractor. Changes are logged on the revision record sheet (fig. 2). This sheet is then attached to the CM contractor's file copy of the checksheets for the aeropropulsion facilities.

(c) Other Documents

Other documents important to the facility baseline, such as facility maintenance manuals, facility instrument manuals, select vendor manuals, critical calibration data, and safety analysis reports, although not necessarily configuration control documents, will be filed and maintained by the CM contractor acting as the focal person for this type of information.

6.3.4 Research Facility Drawing Files

The CM contractor will ensure that a complete set of facility baseline drawings under configuration control is provided to all aeropropulsion facilities. While proposed changes are being developed, these drawings will be marked up and eventually copies of the marked-up drawings will be submitted along with an RFC to obtain approval for the proposed changes. Copies of the marked-up drawings are to remain in the facility until updated drawings become available. The originator of the change will replace the marked-up drawings with the completed copies; however, it is the CM contractor's responsibility to ensure that the research facility drawing files are current before closing out an RFC.

6.4 CHANGE CONTROL SYSTEM

6.4.1 Definition

The change control system (CCS) described in this section sets forth the policy and responsibility for configuration change control of the aeropropulsion facilities at the Lewis Research Center. This system defines the procedures used to process proposed changes to a facility's baseline configuration and to control and maintain its documents. The CCS requires the completion of a specific RFC form (fig. 4) that allows interfacing with individuals whose job it is to ensure the maintenance of "as-built" FBL documents, as well as to ensure that the facility configuration constitutes the changes as approved.

Changes to a facility baseline under configuration control are accomplished through the CCS; figure 1 is a flow chart of the change control process described in the next section.

6.4.2 Overview of a Typical Change Process

Under the CCS, all proposed changes to a facility baseline configuration will be initiated through the RFC form and its associated task order, work request, purchase request, etc., and supporting sketches and/or marked-up drawings, or checksheets. Emergencies, programmatically driven temporary changes, and major modifications are handled somewhat differently, as described later. Once the originator of a change obtains the approval signature of the cognizant facility manager and a control number is obtained from the CM contractor's office, the change will be implemented through the normal established process. For systems changes this could include design, fabrication, procurement, installation, safety review, checkout, etc. Procedure changes are generally accomplished by approved changes to the checksheets.

The CM contractor ensures that changes defined in the RFC are accomplished and verifies that the documents reflect the work performed. The CM contractor also verifies that proper signatures for updated or new documents are obtained, that a safety review, if required, has been completed, that new documents replace the old ones in the field, and that the originals are returned to the controlled files. He/she then closes out the RFC.

6.4.3 Operational Emergencies

When an emergency arises during the operation of a test facility, the test director approves a necessary change. The "squawk sheets" (used to record problems during a test run), the marked-up checksheets, or the operator's test-run log book (used in some facilities to establish a time/event record of test-run activities) are used for noting that changes have been made. If the changes are proposed to be permanent, it is the test director's responsibility to be sure that an RFC is submitted and approved before the next test; otherwise, he/she ensures that the original configuration is restored after the test run. This method is consistent with standard procedures used in the past, with the exception of the RFC and approval requirement for permanent proposed changes.

6.4.4 Programmatically Driven Temporary Changes

Temporary facility configuration or procedure changes such as may be needed for a specific program are to be processed with an RFC on which it must be noted that the proposed change is a temporary one. In these cases, the drawings and checksheets will be marked up to accomplish the temporary change, and a copy of the RFC will be attached to the originals, indicating that the modifications are temporary. The configuration and procedures are restored at the end of the program (as indicated on the RFC) and verified, and the RFC is then closed out.

6.4.5 Major Modifications or Construction of Facility Changes

Established Lewis procedures are to be followed where major modifications or construction of facility (CoF) work is involved. It is the facility manager's responsibility to ensure that an RFC is issued covering the major modifications so that the Configuration Management Office has the means to ensure proper control of the documentation. Generally, verified drawings and procedures are provided for completed major projects enabling the cognizant facility manager to establish its FBL and enter the project officially into the CM program.

6.4.6 Operating Procedure (Checksheet) Changes

Proposed changes to controlled procedures, or checksheets, are to be marked-up, accompanied by an approved RFC, and processed through the change control system procedures described in section 6.5.

Emergency changes are described in section 6.4.3 and are to be processed through the CCS. Facility checksheets bearing marked-up "emergency" changes that are to become permanent are to be updated before the next test run or as soon as feasible. In the interim, copies of the approved revised (marked-up) checksheets are to be placed in the test facilities file (replacing outdated copies) and used for subsequent runs until updated copies are processed.

6.5 PROCEDURES FOR PROCESSING FACILITY CHANGES

The flow chart shown in figure 1 represents a typical flow diagram for processing a proposed change to facility systems, equipment, or procedures. Test models or test hardware are not a part of the facility baseline configuration.

6.5.1 Change Request Initiation

In accordance with existing procedures, anyone associated with a facility can initiate a proposed change to that facility. However, under the CCS, the originator must complete the top blocks of an RFC form in addition to completing the normal work request, task order, or purchase request. Both forms, along with supporting marked-up drawings, procedures, or sketches, as necessary, are forwarded to the cognizant AFED facility manager by way of the configuration control coordinator.

6.5.2 Review, Approval, and Assignment of Control Number

The facility manager reviews the proposal, decides whether or not it should be implemented, determines if it alters the facility configuration, indicates if a review for safety is needed, and signs his/her approval, if warranted. An unapproved RFC is returned to the

originator with an explanation or suggested action. An approved package is sent to the CM contractor for assignment of a control number. Once a control number is assigned, copies of the package are placed in the CM files and the RFC package is returned to the originator so that he/she can implement the approved work through normal established procedures.

6.5.3 Change Implementation Phase

Implementation of the approved change is initiated by the originator and processed as shown in figure 1. The CM contractor will report the status of RFP's to the configuration control coordinator on a monthly basis.

6.5.4 Safety Review

When the facility manager indicates on the RFC "review/approval" block that the proposed change warrants a safety review prior to operation, the originator must satisfy this requirement and the CM contractor ensures that the originator has the required safety approval. This will be evidenced by the signature of the appropriate AFED Branch Supervisor, or, if warranted, a member of the appropriate area safety committee, who will sign in the "verification/closeout" section of the RFC.

6.5.5 Verification and Document Control

The CM contractor's office will verify that the completed work has been done as directed by the approved RFC and ensure that the documents (i.e., drawings, manuals, and procedures) have been updated to reflect the changes. This is evidenced by a signature in the appropriate blocks in the "verification/closeout" section of the RFC. The CM contractor will ensure that the proper signatures have been obtained on the drawings, change blocks, and/or facility configuration control verification decals (described in the appendix under Field Verification) where applicable. He/she is then responsible for returning the original drawings and documents to the controlled files. The originator is responsible for replacing all marked-up drawings in the facility files with the updated versions. Where manual or procedure changes are affected, copies of the updated pages (and, in the case of manuals, a signed revision sheet) are sent by the CM contractor to responsible document-holders in the field.

6.5.6 Request-for-Change Closeout

Upon completion of the documentation updating and field verification, the assigned CM contractor's office representative closes out the RFC with his/her signature. The original RFC and revised supporting documents are filed by the CM contractor. Copies of the completed RFC are sent to the originator and the facility manager for their records.

7.0 AUDITS

All new work that changes a facility's baseline configuration or procedure must be documented to reflect those changes. The configuration control program described herein defines the rules and processes for accomplishing this task. In order to ensure that all changes are acted upon as described in the CCS, monthly audits are performed by the CM contractor's office to ensure that additions or changes to a facility's baseline configuration are properly processed, documented, and verified.

7.1 WORK REQUEST REVIEWS

The audit of requested work that may involve changes to a facility's defined configuration is accomplished by reviewing three general areas of support activities: (1) the job summary printouts from design, fabrication, and installation support groups, (2) the task order (form NASA-C-392), or (3) other related job request process such as facility test-run log books or test-run squawk sheets that define installation and modification tasks to be performed by technicians working in the facilities.

7.1.1 Support Organizations' Work Requests

The management of the organizations that support requests for new facility installations and/or modifications routinely publish printouts (generally on a monthly basis) listing new requests for services from their organizations. These organizations include the Engineering Directorate (ED), the Facilities Engineering Division (FED), the Facilities Operations Division (FOD), the Fabrication Support Division (FSD), and, in some cases, the Computer Services Division (CSD).

The configuration control contractor reviews these reports monthly to identify new work related to facilities under the Aeropropulsion Facilities Configuration Management Program. The CM contractor assesses these lists and contacts the originators to determine if the requested changes affect the facility's configuration and its documents. The contractor ascertains that the procedures, as defined in the CCS, are complied with.

Audit follow-up by the CM contractor will be initiated for all new work and for all finished work not properly processed. New work requests initiated without an RFC form are to be subsequently documented on an RFC for the facility manager's approval, and required facility drawing changes will be accomplished through the change control process. Work in progress or recently completed will also require an (after the fact) RFC. It will be reviewed by the facility manager for his/her approval and it will be verified that the installation and documentation agree and that all safety considerations have been resolved.

7.1.2 Test Installation Work Requests

Installation of or modifications to a facility's configuration are often accomplished through the test facilities' technicians. A task order, or similar work request form, must be used to initiate the work. Larger jobs are handled through contractors and administered by the FOMD and are covered as described previously.

The configuration control contractor reviews the recent task orders, squawk sheets, etc., of each facility Test Installation Division (TID) organization supporting the Aeronautics Directorate facilities. Facilities included are

- Propulsion Systems Laboratories 3 and 4 (PSL)
- Major Wind Tunnels (10'x10' and 8'x6'/9'x15') and Icing Research Tunnel (IRT)
- Engine component research facilities (Engine Research Building (ERB) and Engine Components Research Laboratory (ECRL))
- Combustor Research Laboratory (CRL), Power Lift Facility (PLF), and Vertical Lift Facility (VLF)

Audit follow-up by the CM contractor will be initiated and resolved in a manner similar to that described in section 7.1.1.

7.2 OPERATING PROCEDURE REVIEWS

As described in section 6.2.4, copies of the latest revisions of operating procedures are kept under control in the CM contractor's files. Although it is the responsibility of the test director to ensure that the test-run checksheets agree with the latest revision date, the CM contractor will conduct a monthly audit to ensure that both copies agree. Marked-up copies are to be updated in a timely manner.

8.0 REPORTING

The CM contractor will make a monthly report on the status of RFC's processed through the CCS to the configuration control coordinator from the Facilities Management Branch.

APPENDIX - BASELINE DRAWINGS ASSESSMENT, UPDATING, AND VERIFICATION

BASELINE ASSESSMENT

A requirement of the Aeropropulsion Facilities Configuration Management Program is that drawings representing a facility's configuration be identified and listed for inclusion in the Facility Baseline List (FBL). The facility manager, through the designated AFED operations engineers and in conjunction with the CM contractor, has the responsibility of developing this list and assessing it for completeness. A record is kept of required drawings that must be made in the future for specific systems. When the approved new drawings are generated or revised, the FBL is to be amended by the CM contractor to reflect additions or modifications to the facility. These amended lists are to be distributed by the CM contractor to personnel associated with the facility.

FIELD VERIFICATION AND DRAWING UPDATING

Configuration field verification is that portion of configuration control which ensures that both hardware and software meet the approved engineering design and performance requirements. This is accomplished at Lewis through design and safety reviews. In addition, all drawings making up the FBL are to be reviewed and field verified to reflect the current installation prior to its being integrated into the CM program.

The review consists of checking in the field, component by component, wire by wire, etc., to ensure that the drawings and the actual installations agree. Existing FBL drawings are marked up to reflect the actual installed systems and as-built configurations. Completed marked-up drawings are sent to the appropriate drafting organization to complete the task of updating. When no drawings for actual facility installations exist, formal drawings are to be generated.

FBL drawings are certified to be "field verified" by the signature of a person attesting that the drawing reflects the actual installation for systems being reviewed for accuracy. Each FBL original drawing or microfilm card representation of a facility drawing must have a field-verified decal affixed. The CM contractor is to ensure that decals are on all aeropropulsion-controlled drawings. Samples of the decals and stamp appear in figure 3.

PARTIAL DRAWING VALIDATIONS

The verification decal on drawings under configuration control will be signed and dated by the person attesting to the drawing's verification. When only portions of existing facility baseline drawings were changed, as, for example, with modifications, and the remaining portions of that drawing have not yet been verified, it will be so noted; that is, the decal will not be signed until a complete verification and subsequent drawing updating is done. The change block, however, will be initialed and the relevant RFC control number noted to indicate that only the portion covered by the RFC has been validated. The CM contractor will make every practical effort to accomplish field verification of the remaining portions of these drawings.

MAJOR MODIFICATIONS OF CONSTRUCTION OF FACILITY PROJECTS

Drawings of the as-built facility are generally a project requirement when major facility installations are completed. It is the responsibility of the Lewis project engineer associated with each project to ensure that the completed drawings represent the field installation. The project engineer, or his/her appointed representative(s), will ensure that all documents (drawings, procedures, etc.) represent the design requirements and the as-built installation and that verification decals are affixed and signed on all drawings thus verified. Once the facility is operational, all procedures, or checksheets, are stamped, indicating that they are under configuration control. The CM contractor will put the completed original documents into the controlled files.

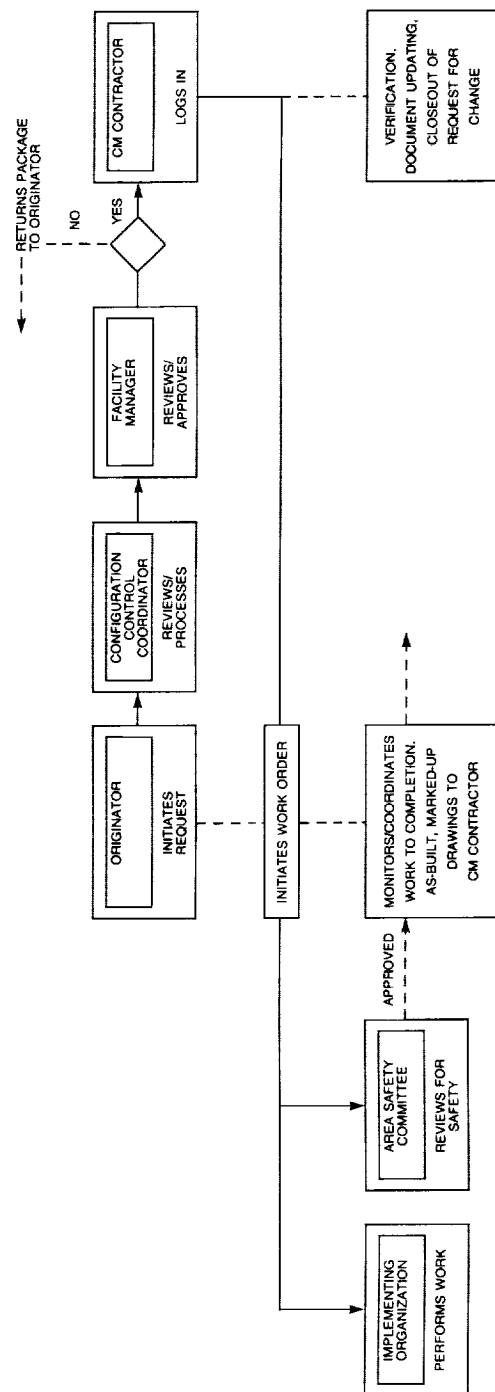


Figure 1.—Simplified flow diagram of aeropropulsion facilities change control system.

THIS DOCUMENT IS UNDER CONFIGURATION CONTROL					
REVISION RECORD SHEET		DOCUMENT NAME:			
ALL DOCUMENT REVISIONS ARE TO BE ACCOMPANIED BY A REQUEST-FOR-CHANGE FORM (RFC)					
REVISION DATE	DESCRIPTION OF REVISION	RFC NO.	PAGES AFFECTED	CM CONTRACTOR	FACILITY MANAGER

NASA-C-8590a (3-89)

Figure 2.—Revision record sheet for documents under configuration control.

<p align="center">AEROPROPULSION FACILITY BASELINE DOCUMENT</p> <hr/> <p align="center">THIS DOCUMENT UNDER CONFIGURATION CONTROL</p> <p align="center">APPROVED BY: _____ DATE: _____</p>

- (a) Configuration control stamp for controlled manuals and operating procedures, or checksheets.

<p align="center">AEROPROPULSION FACILITY BASELINE DRAWING</p> <hr/> <p align="center">THIS DRAWING UNDER CONFIGURATION CONTROL</p> <p align="center">FIELD VERIFIED BY: _____ DATE: _____</p>

- (b) Verification decal for full-size tracings of original drawings.

<p align="center">AEROPROPULSION FACILITY BASELINE DRAWING</p> <hr/> <p align="center">THIS DRAWING UNDER CONFIGURATION CONTROL</p> <p align="center">FIELD VERIFIED BY: _____ DATE: _____</p>

- (c) Verification decal affixed to microfilm cards of drawings without tracings for CAD-generated drawings.

Figure 3.—Samples of stamp and decals used in document control.

Report Documentation Page

1. Report No. NASA TM-102541		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Aeropropulsion Facilities Configuration Control Procedures Manual				5. Report Date March 1990	
				6. Performing Organization Code	
7. Author(s) James J. Lavelle				8. Performing Organization Report No. E-5351	
				10. Work Unit No. None	
9. Performing Organization Name and Address National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio 44135-3191				11. Contract or Grant No.	
				13. Type of Report and Period Covered Technical Memorandum	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546-0001				14. Sponsoring Agency Code	
15. Supplementary Notes					
16. Abstract Lewis Research Center senior management directed that the aeropropulsion facilities be put under configuration control. A Configuration Management (CM) program was established by the Facilities Management Branch of the Aeropropulsion Facilities and Experiments Division (AFED). Under the CM program, a support service contractor was engaged to staff and implement the program. The Aeronautics Directorate has over 30 facilities at Lewis of various sizes and complexities. Under the program, a Facility Baseline List (FBL) was established for each facility, listing which systems and their documents were to be placed under configuration control. A Change Control System was established requiring that any proposed changes to FBL systems or their documents were to be processed as per the Change Control System. Limited access control of the FBL master drawings was implemented and an audit system established to ensure all facility changes are properly processed. This procedures manual sets forth the policy and responsibilities to ensure all key documents constituting a facilities configuration are kept current, modified as needed, and verified to reflect any proposed change. This is the essence of the Lewis Aeropropulsion Facilities Configuration Management program.					
17. Key Words (Suggested by Author(s)) Facilities configuration control Facility baseline drawing list Change control system			18. Distribution Statement Unclassified - Unlimited Subject Category 38		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of pages 23	
				22. Price* A03	

<h1 style="text-align: center;">REQUEST FOR CHANGE</h1> <h2 style="text-align: center;">AEROPROPULSION FACILITIES</h2>		CONTROL NO.	
		LOG-IN DATE	
INSTRUCTIONS			
<ul style="list-style-type: none"> • Originator will send RFC, WR, TO, etc. to configuration control coordinator (CCC), Mail Stop 6-9 • CCC will obtain facility manager approval and submit to CM contractor for control no. and log-in date • CM contractor will return package to originator to implement change, satisfy safety concerns • After verifying changes, documentation, and safety, CM contractor will close out and file RFC • CM contractor will send copies of completed RFC to originator, CCC, and facility manager 			
FACILITY NAME		ATTACHED WR OR TO	
ORIGINATOR/ORG. CODE		DATE	
REASON FOR CHANGE			
DESCRIPTION OF CHANGE (Sketches/Marked-up copies attached? <input type="checkbox"/> YES <input type="checkbox"/> NO)			
KNOWN BASELINE DOCUMENTS AFFECTED			
SAFETY IMPLICATIONS: HOW RESOLVED?			
REVIEW/APPROVAL (AFED) <input type="checkbox"/> ALTERATION OF EXISTING FACILITY CONFIGURATION; DOCUMENTATION <input type="checkbox"/> MAINTENANCE/REPAIR USING IDENTICAL PARTS <input type="checkbox"/> REVIEW FOR SAFETY PRIOR TO OPERATION		VERIFICATION/CLOSEOUT (CM Contractor) <input type="checkbox"/> CHANGES HAVE BEEN DOCUMENTED <input type="checkbox"/> DOCUMENTS REFLECT REQUESTED/COMPLETED WORK <input type="checkbox"/> SAFETY CONSIDERATIONS SATISFIED	
CONFIGURATION CONTROL COORDINATOR	DATE	AREA SAFETY COMMITTEE CONCURRENCE	DATE
FACILITY MANAGER	DATE	CM CONTRACTOR	DATE

NASA-C-8590 (Rev. 3-89)

Figure 4.—Request-for-change (RFC) form.